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THE USE OF CANNABIS



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THE USE OF CANNABIS

A spirited debate is taking place about the effects of cannabis on man. A group of experts convened by WHO¹ has recently made an authoritative examination of the subject from the scientific viewpoint, assessing present knowledge of the effects of cannabis on man and indicating where further research is needed. The report² of the Scientific Group, on which the following article is based, is supported by almost 200 references to studies carried out in many parts of the world.

Reprinted from the *WHO Chronicle* 26 (January 1972): 20-28.

¹Members: Dr. T. Asuni, Nigeria; Dr. J. Booij, Netherlands; Dr. H. Isbell, U.S.A. (Chairman); Mr. R. E. Popham, Canada (*Rapporteur*); Dr. N. H. Rathod, United Kingdom; Dr. J. Ribeiro do Valle, Brazil; Dr. M. I. Soueif, Egypt (*Vice-Chairman*); Dr. N. N. Wig, India. Secretariat: Dr. D. C. Cameron, WHO (*Secretary*); Dr. V. Fattorusso, WHO; Dr. W. H. McGlothlin (*Consultant*).

²WHO Scientific Group on the Use of Cannabis (1971) *Report*, Geneva, 47 pages (*Wld. Hlth. Org. Techn. Rep. Ser.*, No. 478). Price: 30 p., \$1.00, or Sw. fr. 3.—.



Cannabis sativa L. is an annual plant that grows wild in most temperate to tropical areas. It has a long history of cultivation, as a source both of fibre (hemp) and of psychoactive substances. The plant produces a resinous substance that contains the major part of the psychoactive and intoxicating ingredients. This substance occurs primarily in the flowering tops and upper leaves,

hardly at all in the stalk and seeds. Psychoactive preparations of the cannabis plant intended for human consumption take many different forms, and are known by hundreds of different local or more general names. For the purposes of this article, preparations mostly containing leaves and flowering tops are referred to as *marihuana*, preparations containing flowering tops but no leaves as *ganja*, and preparations containing primarily resin as *hashish*.

Historical Trends

The intoxicating properties of certain cannabis preparations were probably known in India more than 2,000 years ago, and for centuries cannabis has been widely used by religious mendicants, mystics, and others. *Bhang*, which consists almost exclusively of the leaves, is still taken as a drink or as an ingredient of foodstuffs among all social classes in certain parts of India, particularly during festivals. In some areas, ganja is smoked fairly commonly by men in certain lower-class groups. Only recently has the smoking of cannabis preparations by students and other young people from a wide range of social classes become noticeable, and it is still apparently much less widespread than in some Western countries. Cannabis has been used in indigenous systems of medicine in India for many centuries because of its sedative, mildly analgesic, and other alleged properties.

The area between India and the Mediterranean appears to have become acquainted with cannabis preparations around the seventh century A.D. The preparations were both taken orally and smoked. In North Africa the smoking of marihuana (*kif*) and hashish is still quite widespread despite strong legal sanctions against it, but no upsurge in cannabis use has been observed among young people or middle-class groups.

Cannabis preparations were introduced into Europe, probably from North Africa, around 1860, but they aroused little interest among the general population at that time despite the publication of some colorful accounts of their effects by such writers as Baudelaire and Gautier. They began to

be widely used in western European countries in the 1960's. Young people of all socio-economic classes have tried them in recent years. In the United Kingdom, for example, one small sample survey of a school population indicated that 2.5% had taken the drug at least once, and larger surveys of university students showed that 4-10% had tried cannabis. On the other hand, there is no evidence of more than very occasional use in most eastern European countries.



Marihuana (maconha) has been used for its psychoactive properties for many years in some Latin American countries. Its use there has largely been associated with men of the lower socio-economic groups, but use among young people of other classes has recently been reported. For example, about 1% of college and university students in the state of Sao Paulo, Brazil, are estimated to have tried cannabis at least once. In the U.S.A., cannabis was rarely used for its psychoactive properties until about the end of the last century. Use was at first largely restricted to lower socio-economic minority groups, and it was not until the 1950's that cannabis began to be used among all classes of young people, a trend that has accelerated rapidly in the last few years and is now evident in Canada as well. The groups now taking cannabis in North America are composed largely of middle-class and upper-class young people of secondary school and college age. A recent sample survey of college students in certain parts of the U.S.A. indicated that one-third had at some time tried cannabis.

Cannabis and Other Drugs

Broadly speaking, there has been a tendency to use cannabis as the principal intoxicant in some regions (e.g., India, Pakistan, North Africa) and alcohol in others (e.g., North America, Europe). In many countries the current trend appears to be towards using both alcohol and cannabis. A large proportion of cannabis users also take psychoactive dependence-producing drugs of the amphetamine, barbiturate, hallucinogen, and morphine types, and this greatly complicates the task of attributing drug effects to a single substance.

The assertion is commonly made that the use of cannabis leads to the use of other drugs. Supporters of this "stepping-stone" theory hold that adolescents begin with marihuana and later proceed to other drugs, often including heroin, although most observers agree that cannabis has no



pharmacological action disposing users to resort to other drugs. In some countries most heroin users have taken cannabis preparations before trying heroin, but the great majority of cannabis users never proceed to the use of morphine-type drugs. However, it is well established that marihuana use is positively correlated with at least experimental use of other drugs. In some countries the probability of people taking strong hallucinogens such as LSD increases greatly with a rise in their use of marihuana. The longer cannabis is used, moreover, the greater is the probability that opium will be used as well.

These data are, of course, not sufficient to establish causal relationship between the use of one drug and another. It appears likely that important sociocultural and personal factors contribute to any progression from cannabis preparations to other drugs. For example, people who take marihuana often tend to limit their social life to the circle of drug-takers, especially in areas where drug-taking is not socially acceptable. Thus they have more opportunity than most people to try other drugs. It is also possible that certain individuals have a greater personal need than others to experience the effects of drugs, and that chronic intoxication with cannabis contributes to a poor orientation to reality, especially among adolescents.

Chemical Aspects

The chemical constituents of the cannabis plant include a unique group of chemicals called cannabinoids. The five most important cannabinoids, as far as the biological potency of cannabis is concerned, are: (—)- Δ^9 -*trans*-tetrahydrocannabinol (Δ^9 -THC), (—)- Δ^8 -*trans*-tetrahydrocannabinol (Δ^8 -THC), Δ^9 -*trans*-tetrahydrocannabinolic acid (THC-acid), cannabinol (CBN), and cannabidiol (CBD).

The first two are psychoactive when taken orally or by smoking. THC-acid is not active when taken orally, but is partly converted to the active Δ^9 or Δ^8 when smoked. CBN and CBD have very little psychoactivity, but are present in fairly large amounts.

Δ^9 -THC produces most of the effects of cannabis or extracts of cannabis in both animals and man. It is therefore believed, but not entirely proved, that this constituent accounts for most of the pharmacological activity of

cannabis. The Δ^9 -THC content of cannabis preparations is influenced not only by the characteristics of the plant and the place and circumstances of its growth, but also by such factors as the age and methods of storage of the harvested materials. All active substances contained in preparations of cannabis deteriorate with time, the Δ^9 -THC being converted to CBN. Consequently, the Δ^9 -THC content of the different types of cannabis preparations varies widely. Nevertheless, it is possible to establish a rough scale of relative potency for the purpose of making broad comparisons of the preparations commonly used. Thus, marihuana (kif, bhang, etc.), ganja and hashish (charas) may be assumed to average respectively about 1%, 3%, and 5% by weight of Δ^9 -THC.



Patterns of Use. The most common method of taking cannabis is by smoking, but it may also be ingested as a food or beverage. India is the only country in which a significant amount is taken orally, in the form of a beverage made from bhang. The stronger preparations, such as ganja and hashish, are normally smoked in a pipe, which is sometimes so constructed that the smoke is first passed through water. The crude forms, which are less potent, may be smoked in either pipes or cigarettes.

A meaningful evaluation of the consequences of cannabis use for the individual and society must take into account the manner, frequency, amount, and duration of use and the relative numbers of persons conforming to various usage patterns. Studies in the U.S.A. indicate that occasional users far outnumber those who use cannabis almost daily, whereas reports from India, Pakistan, and North Africa are frequently concerned only with regular users. In India, use of 1-2 g of ganja per day (about 30-60 mg of Δ^9 -THC) is considered moderate. In a number of studies in India and North Africa, average daily doses ranged from 13 to 66 mg Δ^9 -THC, while maximum daily doses varied from 200 to 700 mg. These figures for areas where cannabis has traditionally been the principal intoxicant contrast sharply with the one or two marihuana cigarettes (5-10 mg of Δ^9 -THC) typically used by young people in North America and some other areas.

The duration of cannabis use is important. Many authors imply that once the use of cannabis is well established it is likely to continue on a daily basis for many years and is not infrequently a lifelong practice. However, there is some indication that, in India and North Africa, the



period of time over which cannabis is used by individuals may have been exaggerated.

Why People Use Cannabis

There is a remarkable variety of reasons for using cannabis. Association with other users, curiosity as to the effects, and a desire for relief from tension or for a pleasurable feeling are widely cited as reasons for *starting* to use the drug. Many people say they started using cannabis in an attempt to substitute it for alcohol, opium, cocaine, or other drugs. In India especially, religious and traditional medical practices play a role in initiation.

One of the more frequently stated reasons for *continuing* to use cannabis moderately is the sense of well-being and relief from tension experienced. It is used less frequently in an attempt to enhance sexual satisfaction, and to increase the enjoyment of music and food. It is also reportedly taken to alleviate hunger, or to give relief from boredom, frustration, and depression. In Europe and North America, users sometimes cite enhanced performance in creative efforts as a reason for using cannabis. In India, cannabis has long been used by priests and other religious figures as an aid to meditation and to the attainment of mystical states. Wandering religious mendicants sometimes remain in a state of chronic cannabis intoxication, which is interpreted by their followers as a religious trance. The religious use of cannabis has also been noted among certain groups in central and southern Africa, Brazil, Jamaica, and Mexico. There are a few references to the use of cannabis in Africa to provide courage for battles and sexual conquests, but on the whole this practice seems quite rare.

Social reasons are very important. Cannabis, more than any other intoxicant, is used throughout the world in small social settings, so that the desire to achieve a sense of belonging to an intimate group is undoubtedly a significant factor both in beginning and in continuing to use it. The social intimacy may be intensified by the precautions required to avoid legal sanctions.

Characteristics of Cannabis Users. Despite wide differences in socio-cultural setting and extent of use, cannabis users tend to share certain characteristics. First of all, cannabis use is related to age, and is generally most popular among adolescents and young adults. Use is also closely related to sex: except in Europe and North America females hardly use

cannabis at all, and even in these areas the extent of use is low compared with that of men.

In areas of traditional cannabis use, the practice has tended to be confined to the lower socio-economic groups and is at present looked upon with disfavor in almost all countries of the world. Its generally illegal status contributes to this attitude, although disapproval has usually preceded rather than followed the imposition of legal controls.



Individuals who appear to enjoy the effects of cannabis tend to prefer an unstructured and spontaneous style of life, are relatively prone to take risks, value states of altered consciousness, and tend to seek such effects both through drugs and through other methods. Thus cannabis users are most frequently young, male, unmarried, and exhibit some instability with regard to residence, work, school, and goals. Individuals who have no taste for the cannabis experience *per se*, are most apt to show a preference for a controlled, structured, rational, and secure approach to life.

Excessive use of cannabis is associated with personality inadequacies. Persons who exhibit emotional immaturity, low frustration tolerance, and a failure to assume responsibility tend to be over-represented in samples of heavy cannabis users.

Sociocultural Factors. Friendship, peer group approval and pressures, and local customs are often associated with the moderate use of cannabis. Another factor associated with regular and particularly with heavy use is rapid sociocultural change, as is found in situations involving industrialization, urbanization, social conflict, and transition between war and peace. In such circumstances, the individual's system of values may be changing, and the usual cultural restraints placed upon his overt behavior may be removed as a result of separation from family and friends and affiliation with new peer groups. In countries with a long history of cannabis use, extremely poor rural workers are often able to fit moderate use of cannabis into their routine of living, with little tendency to increase the frequency or amount; when they migrate to city slums, however, their use of the drug often increases and becomes undisciplined.

To sum up, the epidemiology of cannabis use involves three factors: (a) the personal characteristics of the actual or potential user, (b) the socio-



cultural pressures on him, and (c) the pharmacological properties of various cannabis preparations. The extent to which use of the drug satisfies conscious or subconscious needs will help to determine whether or not the behavior is sustained.

Effects on Man

Cannabis preparations and Δ^9 -THC are about three times as potent when smoked as when ingested. To obtain the maximum effect from these materials, the smoker must use a technique that is somewhat different from that of smoking tobacco cigarettes and must be learned by practice. When this technique is used, it is believed that roughly 50% of the Δ^9 -THC content of a marihuana cigarette is absorbed by the lungs. The subjective effect begins very rapidly, and an experienced smoker can perceive subjective effects within a minute. The peak effects are probably reached within 20-30 minutes after smoking. The duration varies with the dose, but the effects of a single administration are usually dissipated three or four hours after smoking or about eight hours after oral ingestion.

Immediate Effects. The symptoms experienced after taking cannabis preparations depend primarily on the dose, although they are also influenced by the setting and by the expectations and personality of the user. In experiments with one sample of Δ^9 -THC, threshold doses of 50 $\mu\text{g}/\text{kg}$ by smoking, or 120 $\mu\text{g}/\text{kg}$ orally, resulted chiefly in mild euphoria. With doses of 100 $\mu\text{g}/\text{kg}$ by smoking, or 240 $\mu\text{g}/\text{kg}$ orally, some perceptual and sensory changes also occurred. Doses of 200 $\mu\text{g}/\text{kg}$ by smoking, or 300-480 $\mu\text{g}/\text{kg}$ orally, resulted in marked distortion of sensory perception, depersonalization, and both optical and auditory hallucinations. The quantifiable physiological changes are few. They consist of injection of the conjunctivae, a decrease in muscular strength as measured with a finger ergograph, and an increase in pulse rate. Various doses of cannabis preparations produce some impairment of body and hand steadiness, which persists as long as the effects of the drug. However, gross ataxia does not generally result, even at "high" doses. Speed of tapping and simple reaction time are only slightly impaired, but a 20% decrease in complex reaction time has been measured for an oral dose estimated at 75 mg of Δ^9 -THC. One preliminary study has shown the smoking of two marihuana cigarettes to have little effect on the complex task of operating a driving simulator, although the subjects reported achieving a "social high." However, there is some uncertainty about the potency of the preparation used in this

study. In general, the degree of impairment of psychomotor performance is larger for inexperienced subjects, for large doses, and for complex tasks.



Among the more frequently reported effects of cannabis are sensory and perceptual distortion, particularly of the sense of time. Usually, time is perceived as being longer than clock time. Cannabis users often report increased auditory sensitivity and enhanced appreciation of music. Tests have shown pitch discrimination and other measures of musical aptitude to be unchanged or impaired following the administration of cannabis to non-musicians, although some studies have suggested an improvement in auditory acuity. Some people have reported a subjective impression of enhanced touch, taste, and smell while using cannabis. However, measurements of threshold for touch, vibration, two-point discrimination, olfactory acuity, and visual brightness have shown no change.

Of course, these discrepancies between subjective feelings and objective measurements do not disprove the existence of the former, or their reality for the person experiencing the sensation. At the subjective level, cannabis often enhances touch and other senses, prolongs the perception of time, and sometimes imparts novelty to familiar objects and activities. All these factors may increase the sense of gratification experienced, whether or not enhancement of sensation or of performance can be verified by objective measurements.

Consistent reports of interference by cannabis with short-term and immediate memory functions have focused experimental investigation on this and other cognitive areas. The ability to recall objects and reproduce designs after brief exposure has been found to be slightly to moderately impaired. The performance of more complex arithmetical tasks showed much greater impairment and is clearly dose-dependent.

Oral doses of cannabis estimated at 20 mg of Δ^9 -THC given to inexperienced subjects severely impeded a learning task that required the subject to discover and remember several associations by trial and error. It also significantly impaired reading comprehension. In experienced users the smoking of cannabis (estimated at 18 mg of Δ^9 -THC) caused a pronounced decrease in the coherence, clarity, and time orientation of speech and an increase in free association and dream-like imagery. The



impairment in performance of these more complex tasks appears to arise from difficulty in maintaining a logical train of thought.

In conclusion, cannabis significantly impairs cognitive functions, the impairment increasing with the size of the dose, the complexity of the task, or both.

Acute Psychotoxic Reactions. At high dose levels a state of acute intoxication is usually seen, the major manifestations of which often include paranoid ideas, illusions, hallucinations, depersonalization, delusions, confusion, restlessness, and excitement. The syndrome may resemble an acute psychotic episode. In occasional instances, there may be additional features of a toxic psychosis, such as delirium, disorientation, and marked clouding of consciousness. In most cases these acute effects are temporary and disappear within a few hours, although in some instances they may persist for 1-3 days and occasionally up to 7 days. Syndromes resembling acute intoxication have been reported following relatively small doses of cannabis, e.g., after smoking one cigarette, especially among inexperienced users.

Another type of acute psychotoxic reaction to cannabis is seen in some persons, who appear to be overwhelmed by anxiety, fear, and panic. There is usually very little or no evidence of disorientation, delusions, illusions, or hallucinations. The syndrome may last for a few hours to a few days and may occur not only after large doses but also after relatively small ones (e.g., the equivalent of one or two marihuana cigarettes).

Delayed Phenomena. In addition to these immediate effects of cannabis, other phenomena have been described as being associated with repeated or long-term cannabis use and occur between, as well as during, periods of intoxication. In general, however, the degree and nature of any relationships that may exist between these "delayed phenomena" and the prolonged or intensive use of cannabis have not been established.

Many predominantly physical effects have been attributed to the use of cannabis, but few can consistently be related to it. There is general agreement that persistent physical effects of a significant nature are uncommon following even prolonged use of bhang, if ingested in moderate quantities. It is questionable whether weight loss, emaciation, anaemia, constipation, and other symptoms reported to be associated with cannabis

smoking in India are due to the drug or to poverty, poor nutritional status, and intercurrent infections. Studies in the West have, by and large, failed to show any significant physical deterioration after an average of 7-8 years of marihuana use.



Reports from India have stressed the occurrence of eye changes following long-term use of charas and ganja. The conjunctival injection seen during acute intoxication persists even when the drug is not being used. Preliminary reports of *in vitro* studies do not indicate any cannabis-related increases in chromosomal abnormalities in rats or man. No teratogenic effects of cannabis have been observed in man, although they have been found in rats, hamsters, and rabbits when high doses of cannabis extracts were administered.

Various psychiatric conditions purportedly related to or associated with the use of cannabis have been described, covering a wide range of disorders and situations. There is a group of psychotic reactions, generally associated with "heavy" cannabis use, that last from one to six weeks and present quite varied symptoms, often including schizophrenic, manic, or acute organic features. However, there is only limited, presumptive evidence for the existence of a specific cannabis psychosis of this type, although the evidence is sufficient to warrant the initiation of carefully controlled investigations.

The literature often mentions a characteristic personality deterioration among older habitual users after prolonged "excessive" use. Such individuals show a simple-minded, carefree state and are sometimes described as "kif-happy." However, no systematic scientific study has been made to assess their previous personalities, the social factors involved, and the occurrence of such a syndrome among non-users of cannabis.

There is evidence that, under certain conditions, the regular use of cannabis for several years is associated with measurable deficits in a number of psychomotor and cognitive functions. In a study of 850 hashish users and 839 non-users drawn from a population of prisoners in Egypt, differences between users and controls were detected in a number of standardized objective tests to assess speed and accuracy of psychomotor performance, initial reaction time, memory for digits, and memory for designs. It must be stressed that the association between cannabis use and the reported deficits does not necessarily indicate a causal relation-



ship. The differences might pre-exist or be related, for example, to changes in life style occasioned by regular participation in socially unacceptable and unlawful activities.

A number of authors claim a fairly consistent association between "heavy" use of cannabis and what is sometimes called the "amotivational syndrome." This has been especially emphasized in connection with young people in Western countries. Among the main characteristics usually cited are apathy, emphasis on the present rather than the future, preference for fantasy rather than rationality, child-like thinking, and preference for a loosely structured type of life. It has been suggested that the clinical picture resembles that of patients with an organic brain syndrome. However, the evidence might equally suggest an acquired pattern of behavior in which cannabis acts as a catalyst. Among impressionable adolescents, cannabis-induced suggestibility may facilitate the rapid adoption of new values and behavior patterns, especially when the drug is taken in a socially-alienated subculture that strongly advocates such changes.

It is possible that some long-term behavioral effects attributed to cannabis use are due largely or in part to the sociocultural context in which the drug is taken. For example, in a society where cannabis use is illegal and generally disapproved of, the user is *ipso facto* engaged in non-conforming behavior. This in itself may close various avenues of social adjustment to him, and lead to the adoption of a different style of life involving a number of characteristic behavior patterns developed independently of drug use. Some of these patterns may be viewed as deviant by a majority of the society, but one would not be justified in attributing them to the pharmacological action of the drug.

Cannabis and Crime. It is sometimes claimed that loss of control during cannabis intoxication may result in violence or other forms of impulsive behavior. The evidence in support of this argument is largely anecdotal, although it appears that violent and impulsive behavior is not infrequent among persons with relatively acute psychotic reactions to cannabis. At the same time it must be remembered that such acute reactions are not common; since disruptive behavior is likely to draw attention to them, individuals exhibiting such behavior are likely to be over-represented in hospital samples.

Several investigators have sought to establish the overall prevalence of detected crime among users. Their studies show a correlation of cannabis use with crime, but do not establish causal relationships. They show an association between cannabis use and minor asocial or antisocial behavior, but not between cannabis use and major crime. Those studies that begin with a sample of persons arrested for using cannabis generally show a much higher correlation with subsequent delinquent behavior than do studies that begin with a more representative sample of cannabis users. Even among persons who have never used cannabis, for that matter, a positive correlation exists between arrest and subsequent delinquent behavior.



Some military studies have shown that marihuana users exhibit poor adjustment to military life, but little aggressive criminality. Two studies of Brazilian prisoners similarly concluded that cannabis played a minimal role in crimes of violence. In the U.S.A., a recent study of juvenile drug users, mostly from lower-class minority groups, found that marihuana users were less likely to show aggressive behavior than were the group who preferred alcohol. Moreover, they found that a shift from alcohol to marihuana was likely to be accompanied by a tendency towards less delinquent behavior.

Tolerance and Dependence. Tolerance is “an adaptive state characterized by diminished response to the same quantity of a drug.”³ Some evidence of tolerance in “heavy” cannabis users has been reported. In an experimental study in which subjects smoked marihuana *ad libitum* for 39 days, the number of cigarettes taken daily slowly increased throughout the period, while the characteristic euphoric reaction and the increase in pulse rate disappeared after the first few days. Some ganja and charas smokers in India consume daily amounts estimated to contain an average of 720 mg of Δ^9 -THC. It seems doubtful whether such large doses could be consumed unless some degree of tolerance had developed.

Physical dependence has been described as “an adaptive state that manifests itself by intense physical disturbances when the administration of the

³Eddy, N., Halbach, H., Isbell, H., and Seevers, M. (1965) Drug dependence: its significance and characteristics, *Bull. Wld. Hlth, Org.*, 32, 721-733.



drug is suspended.”³ There is no evidence that the withdrawal of cannabis, even from an extremely heavy user, produces an abstinence syndrome that begins to approach in severity those produced by drugs of the alcohol, barbiturate, and morphine types. However, reports have been made of some possible abstinence phenomena, including mild to moderate anxiety, depression, weakness, sleep disturbances, sweating, and fine tremors.

Psychic dependence has been described as a condition in which a drug produces “a feeling of satisfaction and a psychic drive that require periodic or continuous administration of the drug to produce pleasure or to avoid discomfort.”³ The Scientific Group was of the opinion that many regular (almost daily) users of cannabis exhibit psychic dependence, as do some less frequent but relatively “heavy” users, but the great majority of people who use it a few times on an experimental basis, or casually on a few festive occasions a year, could not be said to exhibit psychic or any other dependence on cannabis.

Research Needs

There is a substantial fund of knowledge about (a) the properties of the cannabis plant and the various psychoactive preparations derived from it, (b) the general manner in which those preparations are used in different parts of the world, (c) some of the individual and sociocultural factors associated with their use, and (d) the dose-related immediate effects on man of taking cannabis and Δ^9 -THC. There are, nevertheless, a number of important questions to be answered with regard to these areas. It is evident also that there are at present many more questions than answers concerning the effects on man of prolonged cannabis use.

In the past few years, there has been a major expansion of research on the psychoactive constituents of cannabis, their pharmacological and toxicological effects, and their mode of action. The information obtained makes it increasingly important to intensify current research on (a) major epidemiological problems in widely varying sociocultural settings, and (b) the effects on man of using various cannabis preparations in differing amounts for specified, particularly prolonged, periods of time. These studies can be carried out only in relation to human subjects who are taking cannabis or who have taken it for some time, and laws and regulations governing the control of cannabis should make allowance for the legitimate needs

of such research. Where they do not already exist, provisions should be considered that would permit the possession of necessary research materials by accredited investigators and the conduct of epidemiological research (e.g., surveys of patterns of use) without legal hazard to either the investigator or the user.

It is also important to foster the development of research programs that are sufficiently similar in approach and methods to permit informative comparisons and cross-cultural analyses of studies carried out in different areas. In view of the great variability in the degree of psychoactivity produced by different cannabis plants and preparations, steps need to be taken to ensure that standard materials of known chemical content are available for experimental studies. Agreed chemical and biological criteria of potency and standard techniques for handling and analysing samples are also required.





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